PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P14156PCDK	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/DK2004/000037	International filing date *(day/month/year)* 22.01.2004	Priority date *(day/month/year)* 22.01.2003
International Patent Classification (IPC) or national classification and IPC A22B3/00		
Applicant LINCO FOOD SYSTEMS A/S		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 9 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
20.08.2004	25.02.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Kock, S Telephone No. +49 89 2399-2173

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000037

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages	
8	as originally filed
1-7	received on 18.01.2005 with letter of 14.01.2005
Claims, Numbers	
1-8	received on 18.01.2005 with letter of 14.01.2005
Drawings, Sheets	
1/2-2/2	received on 18.01.2005 with letter of 14.01.2005

   ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000037

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-4
Inventive step (IS)	Yes:	Claims	5-8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-8
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1) A method according to the preamble of independent claim 1 is known from D1 = US-A-6 174 228. Claim 1 further comprises the features "...the influence of the gas for stunning of the animals is adjusted by reducing or prolonging the conveying time **and/or** the active conveying route length of the animals on said conveyors through the stunning chamber".

From D1, column 4, lines 35-44, it is known that the influence of the stunning gas can be adjusted be varying the speed of the conveying belt (i.e. "prolonging or reducing the conveying time") and by adjusting the length of the conveying chamber/zone by means of for example curtains (i.e. "adjusting the active conveying route").

The subject-matter of claim 1, both the "**or**" and the "**and**" version, thus lacks novelty over D1 (Article 33(2) PCT).

2) The subejct-matter of claim 2 (increase or reduce speed of conveyor) is disclosed in D1; column 4, line 38 (Article 33(2) PCT).

The subject-matter of claim 3 (reducing or prolonging the active conveyor runs) is disclosed in D1; column 4, line 40 (Article 33(2) PCT). The active length is seen as the part of the conveying path, ie. tunnel, herein the stunning gas affects the animals.

The subject-matter of claim 4 (varying the gas concentration) is likewise disclosed in D1; column 44, lines 44-53 (Article 33(2) PCT).

4) The device as defined in claim 5 (and dependent claims 6-8), ie. either successive downwards running conveyors having a intermediate horizontal conveyor, the conveyors having mutually interacting telescopic members for adjusting the conveying route length or a helical conveyor interacting with a horizontal, telescopic conveyor is neither disclosed in nor rendered obvious by the available prior art (Article 33(2)(3) PCT).

Re Item VII

Certain defects in the international application

5) Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.

Method and system for gas stunning of poultry for slaughter

Field of the invention

The present invention relates to a method for gas stunning of poultry and of the kind stated in the preamble of claim 1.

Background of the invention

Over time, many different methods have been proposed for gas stunning of poultry arriving at the poultry slaughterhouse in transport crates, with no remarkable success. In practice however, several parameters must be considered in order to be able to optimise a method for gas stunning of poultry for slaughter.

To optimise the method, the following parameters must be considered:

- Conveying speed (capacity of the system).
- Size and number of birds in the transport crates.
- The physical condition of the poultry flock which is determined by continuously observing variations in stress condition or resistance of the poultry which are significant for determining the time necessary for stunning the poultry which further may vary because of conditions in broiler houses, temperatures, transport time, and waiting time in the slaughterhouse.

To optimise the gas stunning it is furthermore necessary to be able to continuously consider all these parameters prior to and during gas stunning of the poultry supplies delivered to the slaughterhouse, and continuously apply the most advantageous parameters to achieve optimum gas stunning of the actual chicken flock at any time to be stunned and slaughtered, respectively.

To optimise these parameters, different periods of stunning time can be applied, but variations in the gas concentration, and variations of gas concentration in the different sections of the conveying route must also be considered, dependent on the conveying route length and conveying route location in the stunning chamber.

The gas concentration may be monitored and controlled by means of sensors having different locations, and a PLC control system. Adjustment of the stunning time and simultaneous variation of the gas concentration require a change in the previously used methods by which a given slaughtering capacity of number of birds per minute required a fixed conveying time through stunning chamber. A given rate of slaughtering (slaughtering capacity) will always be determined by other subsequent parameters that cannot be changed right away why they are maintained. Consequently it may furthermore be necessary to be able to change the degree of stunning, depending on the condition of the poultry upon arrival at the slaughterhouse and unloading for slaughter.

Purpose of the invention

On this background it is the purpose of the invention to provide an improved method for gas stunning of poultry for slaughter, which method by means of simple provisions and means makes it possible to optimise the stunning by being able to allow for all the parameters mentioned.

Brief description of the invention

The method according to the invention is characterised in that the influence of the gas for stunning of the animals is adjusted by reducing or prolonging the conveying time and/or the active conveying route length of the animals on said conveyors through the stunning chamber. It has surprisingly appeared that by means of such simple provisions it is possible to optimise the stunning, while at the same time allowing for all the parameters mentioned. As an especially important thing it should be mentioned that at the same time it is possible to consider the welfare of the animals by observing the stunning condition of the animals before they reach the actual slaughter. If the stunning condition of the animals is not optimum, it will be easy to prolong or reduce the conveying time and/or the conveying route through the stunning chamber.

An optimum condition of stunning will be that the animals are so well stunned that with certainty they do not awaken before they reach slaughtering. On the other hand it is also important that the animals do not die in stunning because it is important that the pump function of the heart is maintained in order to contribute to the pumping out of blood when the necks of the animals are cut in the actual slaughter.

Appropriately, by the invention a method is used by which the adjustment of the conveying time through the stunning chamber is effected by increasing or reducing the speed of the said conveyors.

By the method according to the invention it may furthermore be advantageous that the adjustment of the conveying route through the stunning chamber is effected by reducing or prolonging the active conveyor runs of the respective conveyors.

Furthermore, the method according to the invention may be modified such that the influence of the gas for stunning of the animals moreover is adjusted by varying the gas concentration at varying heights in the stunning chamber in that increasing gas concentration is applied in a direction downwards in the stunning chamber.

The invention furthermore relates to a system for gas stunning of poultry for slaughter cf. the method according to claim 1, and comprising a substantially horizontal conveyor arranged for receiving and introducing poultry for slaughter to a gas-filled stunning chamber in which a downwards running conveyor is arranged, which conveyor is arranged for successively conveying the poultry downwards in the stunning chamber, and an upwards running conveyor arranged for successively conveying the poultry upwards and out of the stunning chamber, said system being characterised in that said downwards running conveyor either is constituted by a conveyor having a downwards running course and a horizontal course, and by a downwards running conveyor, said conveyors comprising mutually interacting telescopic members for adjustment of the active conveying route length, or are constituted by a helical conveyor interacting with a horizontal, telescopic conveyor.

Preferably, the system according to the invention is provided such that said upwards running conveyor is constituted by conveyors having mutually interacting telescopic members, viz. a horizontal conveyor and an upwards running conveyor having a slanting course.

Appropriately, the system according to the invention is provided such that the stunning chamber is divided into a number of horizontal zones, e.g. a lower zone having a gas concentration (CO^2) of 50% (app. 45-51%), an intermediate zone having

a gas concentration (CO^2) of 25% (app. 32-46%), and an upper zone having a gas concentration (CO^2) of 5% (app. 8-10%), in that sensors are provided in level with the upper zone limits for monitoring and control respectively of the gas concentration in the said zones. The actual gas concentration percentage varies a great deal in connection with shift between pause and operation, and upon changed rate of motion of the animals. This variation in gas concentration has relatively small influence on the stunning result, whereas the time of presence, especially in the first zone, and the total time of presence in the stunning chamber have great influence.

The system according to the invention is preferably provided such that it comprises a PLC control system for controlling a number of mutually dependent mechanical parameters, for example speed of conveyors, setting (17.6 metres/minute), number of birds (chickens) on conveyors, speed of slaughtering line, setting (148 animals/minute).

If one setting is changed, the other settings are changed correspondingly, for example if the birds are larger, it means that there are fewer animals on the conveyors, but the speed of the slaughtering line continues to be the same. Consequently it becomes necessary to convey more animals per minute through the stunning chamber, i.e. increased conveying speed. At the same time each individual bird is larger why it is stunned for a longer time, i.e. longer conveying time and conveying route length respectively are required through the stunning chamber.

Brief description of the drawing

The invention is explained in more detail below with reference to the drawing in which

Fig. 1 shows a longitudinal sectional view, partially in section, through an embodiment of a system for gas stunning of poultry for slaughter according to the invention, and

Fig. 2 shows a top view of another embodiment of a system for gas stunning of poultry for slaughter.

Detailed description of the invention

The system 2 shown in Fig. 1 for gas stunning of poultry for slaughter comprises a supply conveyor (not shown) for supply of poultry, which for example arrives at the slaughterhouse by truck, and which have been taken out of any transport crates before they are transferred to the stunning system 2. The poultry 4 is transferred successively to a stunning conveyor 6 which actually consists of a system of endless conveyors having a number of sections running downwards into a stunning chamber 8, the major part of which consists of a concrete pit 10 lowered in relation to the floor level, which chamber is filled with stunning gas, for example CO^2 with varying gas concentrations, viz. an upper or first zone 12 having a gas concentration of app. 5% (8-10%), an intermediate or second zone 14 having a gas concentration of app. 25% (32-46%), and a lower and third zone 16 having a gas concentration of app. 50% (45-51%).

The gas concentration in the said zones 12, 14, 16 can be further varied according to requirements, for example in relation to bird size or type. The gas concentration in the respective zones is controlled by suitable gas sensors and an actually known gas filling/control system with filling valves.

From the stunning conveyor 6 the poultry 4 is successively conveyed into a downwards running conveyor section 18, which continues into a horizontal conveyor section 20, whose active length can be varied by means of a telescopic system 22. From the conveyor section 20 the poultry 4 is transferred to a downwards running conveyor section 24 whose active length can be varied by means of a telescopic system 26 which interacts with the telescopic system 22 for the conveyor section 20. From the conveyor section 24 the poultry 4, which by now is stunned, is conveyed onto a horizontally running conveyor 28 whose active conveying route length also can be varied by means of a telescopic system 30. The stunned poultry 4 is then conveyed upwards and out from the stunning chamber 8 by means of an upwards running conveyor 32, which, and for being able to interact with the conveyor 26, also comprises a telescopic system 34 for variation of the active conveying route length of the conveyor 28.

From the conveyor 32 the stunned poultry is transferred to an external conveyor for being shackled on a slaughtering line. Shortly after the stunned chickens have been shackled by their legs in slaughter shackles, the chickens pass a slaughter location where their necks are cut so that the chickens bleed out as the pumping function of their hearts is still intact if the gas stunning was optimum.

If it can be found that the gas stunning either is too deep, that is the chickens are already dead, the stunning must be adjusted by shortening the conveying route and/or the conveying time through the stunning chamber so that the stunning becomes lighter. If the chickens on the contrary show signs of too light stunning, the stunning must likewise be adjusted so that the conveying route and/or the conveying time through the stunning chamber are increased.

In both situations, adjustment can be effected by reducing or prolonging the conveying time and/or by changing the active conveying route lengths of the conveyors 20, 24, 28, 32 by means of the telescopic systems 22, 26, 30, 34.

Sensors in given locations ensure that the respective conveyors are in correct positions, for example for small, medium-sized, or large chickens. An important thing which also influences the stunning result is that the poultry 4 is downwards step by step, starting in a low gas concentration of app. 5-10%. The stepwise downwards conveying ensures that the chickens upon start and stop lift their heads whereby they can freely breathe in the relatively low gas concentration. This prevents the poultry from becoming stressed, and injuries are avoided.

To reduce or prolong the conveying time through the stunning chamber 8, it is of course also possible to adjust the speed of the respective conveyors.

After the first part of the downwards movement, the poultry has "fallen asleep" and this continues further down where the gas concentration is max. 50% at the bottom of the chamber. Hereby it is ensured that the chickens will not wake up before their necks have been cut and they have bled out. As regards safety it is furthermore an advantage to lower the stunning chamber to below floor level so that gas leakage above head height is avoided.

The system 36 outlined in Fig. 2 comprises a stunning chamber 38 which like the system 2 (Fig. 1) described above comprises a concrete pit 40 lowered in relation to floor level. After unloading, poultry is transferred to the stunning chamber 38 via a horizontal supply conveyor 42 delivering the bird to a downwards running helical conveyor 44 which at the bottom of the stunning chamber 38 again delivers the now stunned bird to a horizontal, telescopic conveyor 46 from which the stunned bird is transferred to an upwards running conveyor 48 which conveys the stunned bird upwards and out of the stunning chamber 38 for further conveyance to shackling on a slaughtering line, etc.

The conveyors 42, 44, 46 have relatively large widths of for example app. 800 mm each, that is at a given speed, the capacity of these conveyors is large. In a simple manner the width of the conveyors 42, 44, 46 and thus their capacity can be reduced by means of laterally displaceable walls 43, 45, 47. By this lateral displacement of the walls 43, 45, 47 the conveying route length is moreover varied in that the length of the helical conveyor is prolonged by forcing the poultry outwards in the curve and oppositely, by forcing the poultry inwards in the curve.

Alternatively, the capacity of the cooperating conveyors 42, 44, 46 can be varied by varying the conveying speed or the conveying route length in that the number of "twists" of the helical conveyor 44 can be adjusted to the actual conveying need, just as the active length of the telescopic conveyor 46 can b varied. In this connection, it should be mentioned that the slanting position of the upwards running conveyor also can be adjusted. The upwards running conveyor is provided with transversely positioned carriers 50 which, if the conveyor 48 has a very steep course, can be replaced by cups so that the stunned birds will surely be conveyed upwards and out of the stunning chamber 38.

CLAIMS

1. A method for gas stunning of poultry for slaughter arriving at the poultry slaughterhouse for example in transport crates, where gas stunning of the animals is effected after the animals have been taken out of the transport crates, and where the animals by means of a number of conveyors are conveyed successively through a stunning chamber, *characterised* in that the influence of the gas for stunning of the animals is adjusted by reducing or prolonging the conveying time and/or the active conveying route length of the animals on said conveyors through the stunning chamber.

2. A method according to claim 1, *characterised* in that the adjustment of the conveying time through the stunning chamber is effected by increasing or reducing the speed of said conveyors.

3. A method according to claim 1, *characterised* in that the adjustment of the length of the conveying route through the stunning chamber is effected by reducing or prolonging the active conveyor runs of the respective conveyors.

4. A method according to claim 1, *characterised* in that the influence of the gas for stunning of the animals is moreover adjusted by varying the gas concentration at varying levels in the stunning chamber as increasing gas concentration is applied in a downwards direction in the stunning chamber.

5. A system for gas stunning of poultry for slaughter cf. the method according to claim 1 and comprising a substantially horizontal conveyor arranged for receiving and introducing poultry for slaughter to a gas-filled stunning chamber in which a downwards running conveyor is arranged, said conveyor being arranged for successively conveying the poultry downwards in the stunning chamber, and an upwards running conveyor arranged for successively conveying the poultry upwards and out of the stunning chamber, *characterised* in that said downwards running conveyor either is constituted by a conveyor having a downwards running course and a horizontal course, and by a downwards running conveyor, said conveyors comprising mutually interacting telescopic members for adjustment of the active

conveying route length, or are constituted by a helical conveyor interacting with a horizontal, telescopic conveyor.

6. A system according to claim 5, ***characterised*** in that said upwards running conveyor is constituted by conveyors having mutually interacting telescopic members, viz. a horizontal conveyor and an upwards running conveyor having a slanting course.

7. A system according to claim 5, ***characterised*** in that the stunning chamber is divided into a number of horizontal zones, for example a lower zone having a gas concentration (CO^2) of 50% (app. 45-51%), an intermediate zone having a gas concentration (CO^2) of 25% (app. 32-46%), and an upper zone having a gas concentration (CO^2) of 5% (app. 8-10%), as sensors are provided in level with the respective upper zone limits for monitoring and control respectively of the gas concentration in the said zones.

8. A system according to claim 5, ***characterised*** in that it comprises a PLC control system for controlling a number of mutually dependent mechanical parameters, for example speed of conveyors, setting (17.6 metres/minute), number of birds (chickens) on conveyors, speed of slaughtering line, setting (148 animals/minute).